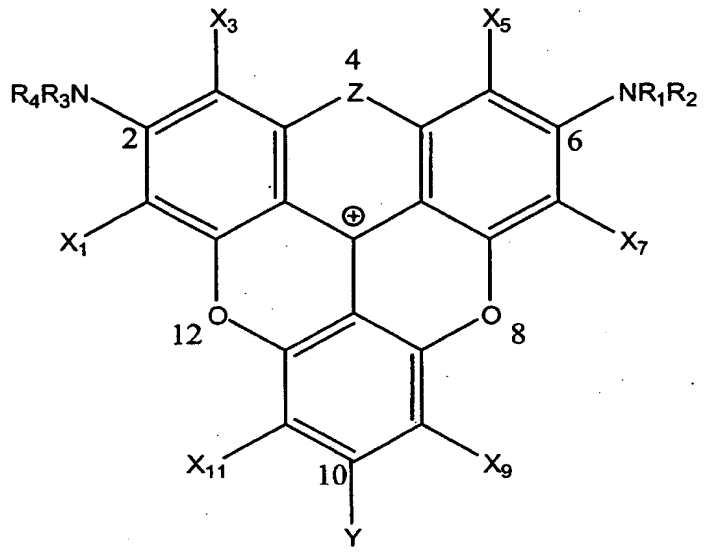
Patent Claims

1. A fluorescent dye compound comprising the structure



wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are independently H, Cl or F;

wherein Y is selected from the group consisting of H, Cl, F, NR_5R_6, OR_7, SR_8, and R_9;

wherein Z is O or NR_{10}, and

wherein R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, and R_{10} is independently H, an optionally substituted alkyl, an optionally substituted aryl, or an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, cyclic amine, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_5 and R_6 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or wherein at least one of R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, and R_{10} comprises at least one reactive group or at least one reactive moiety,

wherein the at least one reactive group is selected from the group consisting of vinyl, allyl, hydroxy, primary amine, secondary amine, carboxy, carbonyl, nitro, cyano, isothiocyanate, halogen, phosphonyl, sulphonate, sulphonyl, sulfamyl, and thiolyl, including any combination thereof,

wherein the at least one reactive moiety is selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, azido, an optionally polymerized substituted or unsubstituted styrene, an optionally polymerized substituted or unsubstituted acrylate, an optionally polymerized substituted or unsubstituted (meth)acrylate, an optionally polymerized substituted or unsubstituted hydroxymethyl(meth)acrylate; an optionally polymerized substituted or unsubstituted acrylamide, an optionally polymerized substituted or unsubstituted acetate, an optionally polymerized substituted or unsubstituted vinylacetate; an optionally polymerized substituted or unsubstituted vinylether; an optionally polymerized substituted or unsubstituted vinylpyrrolidone, an optionally polymerized substituted or unsubstituted oxirane; an optionally polymerized substituted or unsubstituted oxetane, an optionally polymerized substituted or unsubstituted oxolane; an optionally polymerized substituted or unsubstituted episulfide; an optionally polymerized substituted or unsubstituted thiotane; and an optionally polymerized substituted or unsubstituted cyclic amine,

with the proviso that R_1 to R_6 are not all identical linear alkyls when Y is NR_5R_6 and Z is O, and that R_1 and R_2 are not both ethyl when NR_3R_4 and NR_5R_6 both constitute a morpholinyl ring.

2. The fluorescent dye compound according to claim 1, wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are all H.

3. The fluorescent dye compound according to claim 1, wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are all Cl.

4. The fluorescent dye compound according to claim 1, wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are all F.

5. The fluorescent dye compound according to any of claims 1 to 4, wherein Y is selected from H, Cl, and F.

6. The fluorescent dye compound according to claims 5, wherein Y is H.

7. The fluorescent dye compound according to claims 5, wherein Y is Cl.

8. The fluorescent dye compound according to claim 5, wherein Y is F.

9. The fluorescent dye compound according to claim 8, wherein Z is O or NR_{10}.

10. The fluorescent dye compound according to claim 8, wherein Z is O.

11. The fluorescent dye compound according to claim 8, wherein Z is NR_{10}.

12. The fluorescent dye compound according to any of claims 1 to 4, wherein Y is selected from the group consisting of NR_5R_6, OR_7, SR_8, and R_9.

13. The fluorescent dye compound according to claim 12, wherein Y is NR_5R_6.

14. The fluorescent dye compound according to claim 13, wherein Z is O or NR_{10}.

15. The fluorescent dye compound according to claim 13, wherein Z is O.

16. The fluorescent dye compound according to claim 13, wherein Z is NR_{10}.

17. The fluorescent dye according to claim 16, wherein each of R_1, R_2, R_3, R_4, R_5, R_6 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_5 and R_6 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_{10} is an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine.

18. The fluorescent dye according to claim 16, wherein each of R_1, R_2, R_3, R_4, R_5, R_6 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_5 and R_6 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_{10} comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido.

19. The fluorescent dye compound according to any of claims 17 and 18, wherein from 1 to 3 of R_1 to R_6 are substituted alkyl.

20. The fluorescent dye according to claim 15, wherein each of R_1, R_2, R_3, R_4, R_5 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_6 is an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine.

21. The fluorescent dye according to claim 15, wherein each of R_1, R_2, R_3, R_4, R_5 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_6 comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido.

22. The fluorescent dye compound according to any of claims 21 and 22, wherein from 1 to 3 of R_1 to R_5 are substituted alkyl.

23. The fluorescent dye according to claim 15, wherein each of R_1, R_2, R_3, R_5 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_4 and R_6 is independently an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine, wherein R_5 and R_6 can be different or the same.

24. The fluorescent dye according to claim 15, wherein each of R_1, R_2, R_3, R_5 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein each of R_4 and R_6 comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido, wherein R_5 and R_6 can be different or the same.

25. The fluorescent dye compound according to any of claims 23 and 24, wherein from 1 to 3 of R_1, R_2, R_3, R_5 are substituted alkyl.

26. The fluorescent dye compound according to any of claims 23 and 24, wherein R_5 and R_6 are different.

27. The fluorescent dye compound according to any of claims 23 and 24, wherein R_5 and R_6 are the same.

28. The fluorescent dye according to claim 15, wherein each of R_1, R_3, R_5 is a substituted or unsubstituted alkyl, and wherein R_2, R_4 and R_6 is independently an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinyl-

pyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine, wherein R_5 and R_6 can be different or the same.

29. The fluorescent dye according to claim 15, wherein each of R_1, R_3, R_5 is a substituted or unsubstituted alkyl, and wherein each of R_2, R_4 and R_6 comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido, wherein R_2, R_4 and R_6 can be different or the same.

30. The fluorescent dye compound according to any of claims 28 and 29, wherein from 1 to all of R_1, R_3, R_5 are substituted alkyl.

31. The fluorescent dye compound according to any of claims 28 and 29, wherein R_2, R_4 and R_6 are different.

32. The fluorescent dye compound according to any of claims 28 and 29, wherein R_2, R_4 and R_6 are the same.

33. The fluorescent dye compound according to claim 12, wherein Y is OR_7.

34. The fluorescent dye compound according to claim 33, wherein Z is O or NR_{10}.

35. The fluorescent dye compound according to claim 33, wherein Z is O.

36. The fluorescent dye compound according to claim 33, wherein Z is NR_{10}.

37. The fluorescent dye according to claim 35, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_7 is an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine.

38. The fluorescent dye according to claim 35, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_7 comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido.

39. The fluorescent dye compound according to any of claims 37 and 38, wherein from 1 to 3 of R_1, R_2, R_3, R_4 are substituted alkyl.

40. The fluorescent dye according to claim 36, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_7 and R_{10} is independently an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine, wherein R_7 and R_{10} can be different or the same.

41. The fluorescent dye according to claim 36, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein each of R_7 and R_{10} comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido, wherein R_7 and R_{10} can be different or the same.

42. The fluorescent dye compound according to any of claims 40 and 41, wherein from 1 to 3 of R_1, R_2, R_3, R_4 are substituted alkyl.

43. The fluorescent dye compound according to any of claims 41 and 42, wherein R_7 and R_{10} are different.

44. The fluorescent dye compound according to any of claims 41 and 42, wherein R_7 and R_{10} are the same.

45. The fluorescent dye compound according to claim 12, wherein Y is SR_8.

46. The fluorescent dye compound according to claim 45, wherein Z is O or NR_{10}.

47. The fluorescent dye compound according to claim 45, wherein Z is O.

48. The fluorescent dye compound according to claim 45, wherein Z is NR_{10}.

49. The fluorescent dye according to claim 47, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_8 is an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine.

50. The fluorescent dye according to claim 47, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_8 comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido.

51. The fluorescent dye compound according to any of claims 49 and 50, wherein from 1 to 3 of R_1, R_2, R_3, R_4 are substituted alkyl.

52. The fluorescent dye according to claim 48, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to

which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_8 and R_{10} is independently an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine, wherein R_8 and R_{10} can be different or the same.

53. The fluorescent dye according to claim 48, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein each of R_8 and R_{10} comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido, wherein R_8 and R_{10} can be different or the same.

54. The fluorescent dye compound according to any of claims 52 and 53, wherein from 1 to 3 of R_1, R_2, R_3, R_4 are substituted alkyl.

55. The fluorescent dye compound according to any of claims 52 and 53, wherein R_8 and R_{10} are different.

56. The fluorescent dye compound according to any of claims 52 and 53, wherein R_8 and R_{10} are the same.

57. The fluorescent dye compound according to claim 12, wherein Y is R_9.

58. The fluorescent dye compound according to claim 57, wherein Z is O or NR_{10}.

59. The fluorescent dye compound according to claim 57, wherein Z is O.

60. The fluorescent dye compound according to claim 57, wherein Z is NR_{10}.

61. The fluorescent dye according to claim 59, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to

which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_9 is an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine.

62. The fluorescent dye according to claim 59, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_9 comprises a reactive moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido.

63. The fluorescent dye compound according to any of claims 61 and 62, wherein from 1 to 3 of R_1, R_2, R_3, R_4 are substituted alkyl.

64. The fluorescent dye according to claim 60, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein R_9 and R_{10} is independently an optionally polymerized substituted or unsubstituted monomer selected from the group consisting of styrene, acrylate, (meth)acrylate, hydroxymethyl(meth)acrylate, acrylamide, acetate, vinylacetate, vinylether, vinylpyrrolidone, oxirane, oxetane, oxolane, episulfide, thiotane, and cyclic amine, wherein R_9 and R_{10} can be different or the same.

65. The fluorescent dye according to claim 60, wherein each of R_1, R_2, R_3, R_4 is a substituted or unsubstituted alkyl, or R_1 and R_2 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, or R_3 and R_4 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocyclic, and wherein each of R_9 and R_{10} comprises a re-

active moiety selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, such as pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, and azido, wherein R_9 and R_{10} can be different or the same.

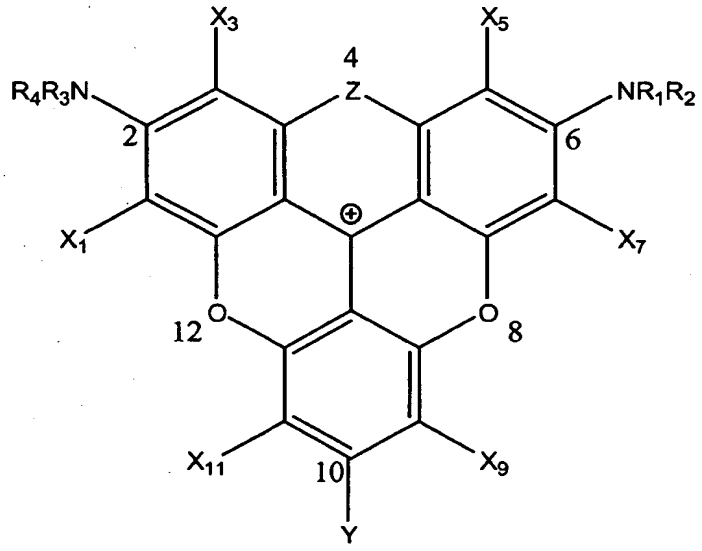
66. The fluorescent dye compound according to any of claims 64 and 65, wherein from 1 to 3 of R_1, R_2, R_3, R_4 are substituted alkyl.

67. The fluorescent dye compound according to any of claims 64 and 65, wherein R_9 and R_{10} are different.

68. The fluorescent dye compound according to any of claims 64 and 65, wherein R_9 and R_{10} are the same.

69. The fluorescent dye according to any of claims 1 to 68, wherein the alkyl is a lower alkyl.

70. A fluorescent dye compound comprising the structure



wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are independently H, Cl or F;

wherein Y is selected from the group consisting of H, Cl, F, NR_5R_6, OR_7, SR_8, and R_9;

wherein Z is O or NR_{10}, and

wherein substituents R_1 to R_{10} are preferably selected independently from the group consisting of:

hydrido,

substituted and unsubstituted alkyl, substituted and unsubstituted haloalkyl, substituted and unsubstituted hydroxyalkyl, substituted and unsubstituted alkylsulfonyl,

substituted and unsubstituted alkenyl,

halo,

substituted and unsubstituted alkoxy, substituted and unsubstituted alkoxyalkyl, substituted and unsubstituted haloalkoxy, substituted and unsubstituted haloalkoxyalkyl,

substituted and unsubstituted aryl,

substituted and unsubstituted heterocyclic,

substituted and unsubstituted heteroaryl,

sulfonyl, substituted and unsubstituted alkylsulfonyl, substituted and unsubstituted arylsulfonyl, sulfamyl, sulfonamidyl, aminosulfonyl, substituted and unsubstituted N-alkylaminosulfonyl, substituted and unsubstituted N-arylaminosulfonyl, substituted and unsubstituted N,N-dialkylaminosulfonyl, substituted and unsubstituted N-alkyl-N-arylaminosulfonyl, substituted and unsubstituted N-alkylaminosulfonyl, substituted and unsubstituted N,N-dialkylaminosulfonyl, substituted and unsubstituted N-arylaminosulfonyl, substituted and unsubstituted N-alkyl-N-arylaminosulfonyl,

carboxy, substituted and unsubstituted carboxyalkyl,

carbonyl, substituted and unsubstituted alkylcarbonyl, substituted and unsubstituted alkylcarbonylalkyl,

substituted and unsubstituted alkoxycarbonyl, substituted and unsubstituted alkoxycarbonylalkyl,

aminocarbonyl, substituted and unsubstituted aminocarbonylalkyl, substituted and unsubstituted N-alkylaminocarbonyl, substituted and unsubstituted N-arylaminocarbonyl, substituted and unsubstituted N,N-dialkylaminocarbonyl, substituted and unsubstituted N-alkyl-N-arylaminocarbonyl, substituted and unsubstituted N-alkyl-N-hydroxyaminocarbonyl, substituted and unsubstituted N-alkyl-N-hydroxyaminocarbonylalkyl, substituted and unsubstituted N-alkylaminocarbonyl, substituted and unsubstituted N,N-dialkylaminocarbonyl, substituted and unsubstituted N-arylaminocarbonyl, substituted and unsubstituted N-alkyl-N-arylaminocarbonyl, substituted and unsubstituted aminocarbonylalkyl, substituted and unsubstituted N-cycloalkylaminocarbonyl,

substituted and unsubstituted aminoalkyl, substituted and unsubstituted alkylaminoalkyl,

amidino,

cyanoamidino,

substituted and unsubstituted heterocyclicalkyl,

substituted and unsubstituted aralkyl,

substituted and unsubstituted cycloalkyl,

substituted and unsubstituted cycloalkenyl,

substituted and unsubstituted alkylthio,

substituted and unsubstituted alkylsulfinyl,

substituted and unsubstituted N-alkylamino, substituted and unsubstituted N,N-dialkylamino,

substituted and unsubstituted arylamino, substituted and unsubstituted aralkylamino, substituted and unsubstituted N-alkyl-N-arylamino, substituted and unsubstituted N-aralkyl-N-alkylamino, substituted and unsubstituted N-arylaminoalkyl, substituted and unsubstituted N-aralkylaminoalkyl, substituted and unsubstituted N-alkyl-N-arylaminoalkyl, substituted and unsubstituted N-aralkyl-N-alkylaminoalkyl,

acyl, acylamino,

substituted and unsubstituted arylthio, substituted and unsubstituted aralkylthio,

substituted and unsubstituted aryloxy, substituted and unsubstituted aralkoxy,

substituted and unsubstituted haloaralkyl,

substituted and unsubstituted carboxyhaloalkyl,

substituted and unsubstituted alkoxycarbonylhaloalkyl, substituted and unsubstituted aminocarbonylhaloalkyl, substituted and unsubstituted alkylaminocarbonylhaloalkyl,

substituted and unsubstituted alkoxycarbonylcyanoalkenyl,

substituted and unsubstituted carboxyalkylaminocarbonyl,

substituted and unsubstituted aralkoxycarbonylalkylaminocarbonyl,

substituted and unsubstituted cycloalkylalkyl, and

substituted and unsubstituted aralkenyl,

wherein at least one of said substituents R1 to R10 comprises

c) one or more reactive groups selected from the group consisting of vinyl, allyl, hydroxy, primary amine, secondary amine, carboxy, carbonyl, nitro, cyano, isothiocyanate, halogen, phosphonyl, sulphonate, sulphonyl, sulfamyl, and thiolyl, or

d) one or more reactive moieties selected from the group consisting of an activated ester, such as N-succinimidyl ester, maleimide ester, or fluorophenol ester, including pentafluorophenol ester; acid halide, such as acid chloride or acid bromide; sulfonyl halide, such as sulfonyl chloride or sulfonyl bromide; tosylate, mesylate, phtalimido, azido, an optionally polymerized substituted or unsubstituted styrene, an optionally polymerized substituted or unsubstituted acrylate, an optionally polymerized substituted or unsubstituted (meth)acrylate, an optionally polymerized substituted or unsubstituted hydroxymethyl(meth)acrylate; an optionally polymerized substituted or unsubstituted acrylamide, an optionally polymerized substituted or unsubstituted acetate, an optionally polymerized substituted or unsubstituted vinylacetate; an optionally polymerized substituted or unsubstituted vinylether; an optionally polymerized substituted or unsubstituted vinylpyrrolidone, an optionally polymerized substituted or unsubstituted oxirane; an optionally polymerized substituted or unsubstituted oxetane, an optionally polymerized substituted or unsubstituted oxolane; an optionally polymerized substituted or unsubstituted episulfide; an optionally polymerized substituted or unsubstituted thiotane; and an optionally polymerized substituted or unsubstituted cyclic amine,

with the proviso that R_1 to R_6 are not all identical linear alkyls when Y is NR_5R_6 and Z is O, and that R_1 and R_2 are not both ethyl when NR_3R_4 and NR_5R_6 both constitute a morpholinyl ring.

71. The fluorescent dye compound according to claim 70, wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are all H.

72. The fluorescent dye compound according to claim 70, wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are all Cl.

73. The fluorescent dye compound according to claim 70, wherein X_1, X_3, X_5, X_7, X_9, and X_{11} are all F.

74. The fluorescent dye compound according to any of claims 70 to 73, wherein Y is selected from H, Cl, and F.

75. The fluorescent dye compound according to claims 74, wherein Y is H.

76. The fluorescent dye compound according to claims 74, wherein Y is Cl.

77. The fluorescent dye compound according to claim 74, wherein Y is F.

78. The fluorescent dye compound according to any of claims 70 to 73, wherein Y is selected from the group consisting of NR_5R_6, OR_7, SR_8, and R_9.

79. The fluorescent dye compound according to claim 78, wherein Y is NR_5R_6.

80. The fluorescent dye compound according to claim 78, wherein Y is OR_7.

81. The fluorescent dye compound according to claim 78, wherein Y is SR_8.

82. The fluorescent dye compound according to claim 78, wherein Y is R_9.

83. The fluorescent dye compound according to claim 78, wherein Y comprises a reactive group capable of undergoing polymerization.

84. The fluorescent dye compound according to claim 83, wherein the reactive group is selected from the group consisting of vinyl, acrylate, methacrylate, acrylamide, methyl oxethane, ethyl oxethane, and ethylene oxide.

85. The fluorescent dye compound according to claim 78, wherein Y is a linker capable of linking the dye compound to a polymer matrix.

86. The fluorescent dye compound according to any of claims 78 and 85, wherein Y is selected from the group consisting of carboxylic acid, benzylic acid, N-succinimidyl ester, acid chloride, pentafluorophenol ester, tosylate, mesylate, halide, primary amine, sulfonyl chloride, isothiocyanate, maleimide, and thiol.

87. The fluorescent dye compound according to any of claims 74 to 86, wherein Z is O or NR_{10}.

88. The fluorescent dye compound according to claim 87, wherein Z is O.

89. The fluorescent dye compound according to claim 87, wherein Z is NR_{10}.

90. The fluorescent dye compound according to any of claims 74 to 89, wherein R_1 to R_{10} are independently

hydrido,

substituted and unsubstituted alkyl, substituted and unsubstituted haloalkyl, substituted and unsubstituted hydroxyalkyl, substituted and unsubstituted alkylsulfonyl,

substituted and unsubstituted alkenyl,

halo,

substituted and unsubstituted alkoxy, substituted and unsubstituted alkoxyalkyl, substituted and unsubstituted haloalkoxy, substituted and unsubstituted haloalkoxyalkyl,

substituted and unsubstituted aryl,

substituted and unsubstituted heterocyclic,

substituted and unsubstituted heteroaryl,

sulfonyl, substituted and unsubstituted alkylsulfonyl, substituted and unsubstituted arylsulfonyl, sulfamyl, sulfonamidyl, aminosulfonyl, substituted and unsubstituted N-alkylaminosulfonyl, substituted and unsubstituted N-arylaminosulfonyl, substituted and unsubstituted N,N-dialkylaminosulfonyl, substituted and unsubstituted N-alkyl-N-arylaminosulfonyl, substituted and unsubstituted N-alkylaminosulfonyl, substituted and unsubstituted N,N-dialkylaminosulfonyl, substituted and unsubstituted N-arylaminosulfonyl, substituted and unsubstituted N-alkyl-N-arylaminosulfonyl,

carboxy, substituted and unsubstituted carboxyalkyl,

carbonyl, substituted and unsubstituted alkylcarbonyl, substituted and unsubstituted alkylcarbonylalkyl,

substituted and unsubstituted alkoxycarbonyl, substituted and unsubstituted alkoxycarbonylalkyl,

aminocarbonyl, substituted and unsubstituted aminocarbonylalkyl, substituted and unsubstituted N-alkylaminocarbonyl, substituted and unsubstituted N-arylaminocarbonyl, substituted and unsubstituted N,N-dialkylaminocarbonyl, substituted and unsubstituted N-alkyl-N-arylaminocarbonyl, substituted and unsubstituted N-alkyl-N-hydroxyaminocarbonyl, substituted and unsubstituted N-alkyl-N-hydroxyaminocarbonylalkyl, substituted and unsubstituted N-alkylaminocarbonyl, substituted and unsubstituted N,N-dialkylaminocarbonyl, substituted and unsubstituted N-arylaminocarbonyl, substituted and unsubstituted N-alkyl-N-arylaminocarbonyl, substituted and unsubstituted aminocarbonylalkyl, substituted and unsubstituted N-cycloalkylaminocarbonyl,

substituted and unsubstituted aminoalkyl, substituted and unsubstituted alkylaminoalkyl,

amidino,

cyanoamidino,

substituted and unsubstituted heterocyclicalkyl,

substituted and unsubstituted aralkyl,

substituted and unsubstituted cycloalkyl,

substituted and unsubstituted cycloalkenyl,

substituted and unsubstituted alkylthio,

substituted and unsubstituted alkylsulfinyl,

substituted and unsubstituted N-alkylamino, substituted and unsubstituted N,N-dialkylamino,

substituted and unsubstituted arylamino, substituted and unsubstituted aralkylamino, substituted and unsubstituted N-alkyl-N-arylamino, substituted and unsubstituted N-aralkyl-N-alkylamino, substituted and unsubstituted N-arylaminoalkyl, substituted and unsubstituted N-aralkylaminoalkyl, substituted and unsubstituted N-alkyl-N-arylaminoalkyl, substituted and unsubstituted N-aralkyl-N-alkylaminoalkyl,

acyl, acylamino,

substituted and unsubstituted arylthio, substituted and unsubstituted aralkylthio;

substituted and unsubstituted aryloxy, substituted and unsubstituted aralkoxy,

substituted and unsubstituted haloaralkyl,

substituted and unsubstituted carboxyhaloalkyl,

substituted and unsubstituted alkoxycarbonylhaloalkyl, substituted and unsubstituted aminocarbonylhaloalkyl, substituted and unsubstituted alkylaminocarbonylhaloalkyl,

substituted and unsubstituted alkoxycarbonylcyanoalkenyl,

substituted and unsubstituted carboxyalkylaminocarbonyl,

substituted and unsubstituted aralkoxycarbonylalkylaminocarbonyl,

substituted and unsubstituted cycloalkylalkyl, or

substituted and unsubstituted aralkenyl.

91. Method for producing a polymer matrix comprising a fluorescent dye, said method comprising the steps of providing a monomer or a polymer matrix and reacting the fluorescent dye compound according to any of claims 1 to 90, or a precursor thereof, with the monomer or polymer matrix, and optionally reacting the fluorescent dye compound precursor to obtain the fluorescent dye compound, and further optionally polymerizing the monomers to obtain a polymer matrix.

92. Use of the fluorescent dye compound according to any of claims 1 to 90 for visualising a beaded polymer matrix.

93. Use of the fluorescent dye compound according to any of claims 1 to 90 in the synthesis of a beaded polymer matrix.

94. An encoded beaded or granulated polymer matrix for solid phase synthesis comprising beads or granules each comprising a plurality of spatially immobilised particles or vacuoles, wherein each particle or vacuole comprises at least one fluorescent dye compound according to any of claims 1 to 90, wherein each particle or vacuole is individually detectable.